

Community Solar Barriers, Project Models, and Considerations for Multifamily Affordable Housing

Community solar can offer immense benefits to multifamily affordable housing (MFAH) providers and low- and moderate-income (LMI) households through reduced electricity bills or enhanced services or building amenities. Although MFAH providers and households may wish to pursue the benefits of community solar, barriers exist. This issue brief summarizes the current MFAH market and challenges to community solar adoption, followed by a discussion of four community solar project models that address solar adoption barriers faced by MFAH providers and households.

Community Solar and Multifamily Affordable Housing Overview

The MFAH market can be divided into two main categories:

1. Unsubsidized or naturally occurring affordable housing (NOAH)
2. Publicly supported multifamily housing.

NOAH stock is comprised of unsubsidized, market-rate housing where the cost of housing does not exceed 30% of median household income. Figure 1 shows that the inventory of NOAH

NCSP and the MFAH Collaborative

The National Community Solar Partnership (NCSP) is a coalition of community solar stakeholders working to expand access to affordable community solar to every U.S. household and enable communities to realize meaningful benefits, such as reduced energy burdens, increased resilience, and workforce development. The NCSP is a U.S. Department of Energy initiative led by the Solar Energy Technologies Office in collaboration with the National Renewable Energy Laboratory (NREL) and Lawrence Berkeley National Laboratory. Partners leverage peer networks, technical assistance, and informational resources to set goals and overcome barriers to expanding community solar access.

One way the NCSP delivers technical assistance is through collaboratives, which are groups of partners within sectors seeking to address common barriers to community solar deployment through peer exchange and support from technical experts. Convened in 2020, the Multifamily Affordable Housing (MFAH) Collaborative aimed to increase community solar access for MFAH residents nationwide. Thirteen MFAH providers from across the United States—with portfolios ranging in size from five buildings to more than 300—participated in the collaborative and received technical support from DOE, NREL, and partners Urban Ingenuity and Stewards of Affordable Housing for the Future (SAHF).

or unsubsidized properties accounts for about 76% of affordable rental units in the United States. The remaining 24% is publicly supported housing, which is regulated and subsidized by some combination of local, state, and federal agencies that require building providers to offer below-market-rate housing to eligible low-income households (CoStar 2016; PAHRC 2020). There is a shortage of affordable housing in the United States, either subsidized or unsubsidized, indicated by data showing only 37 affordable housing rental units for every 100 low-income households nationwide (National Low Income Housing Coalition 2021).

Households that secure affordable housing may still struggle with the cost of home energy, and deploying solar to offset that cost can increase financial stability. One focus of the MFAH Collaborative (see sidebar on p. 1) was to identify pathways for deploying community solar to benefit residents of publicly supported housing. These opportunities are influenced by the government agencies and regulations that oversee the housing. Types of affordable housing, including NOAH and publicly supported housing, are displayed in Figure 1 by percentage of units per type.

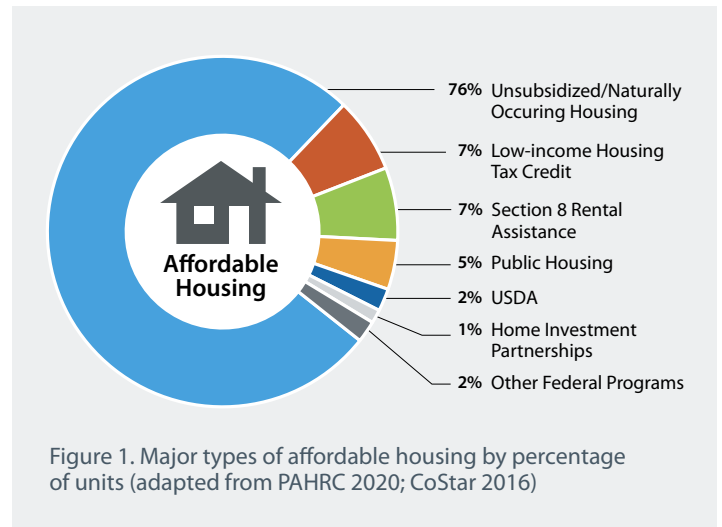
As of 2021, there were over 5,000 megawatts (MW) of community solar across approximately 2,000 projects nationwide. Of these, over 200 projects served at least some LMI customers, with a combined 65 MW of capacity (Chan, Heeter, and Xu 2022), which NREL conservatively estimates would benefit more than 26,000 LMI households (NREL 2021). Although no national data exist on how many of these LMI households reside in MFAH, we know that at least some do. In addition, we know that there is significant potential to serve more LMI MFAH households. NREL estimates that annual solar photovoltaic (PV) generation potential for LMI households in multifamily buildings is 166.7 terawatt hours per year (Sigrin and Mooney 2018). Further, NREL research suggests that about half of Department of Housing and Urban Development (HUD)-subsidized buildings, including public housing, have a technical potential exceeding 10,000 MW.¹ Opening these market opportunities will require addressing unique challenges to deployment in the MFAH sector.

Key Barriers to Affordable Housing Solar Deployment

There are a variety of barriers to deploying community solar on MFAH that make it challenging to complete projects and deliver benefits to those most in need. These barriers include financing limitations, split incentives, utility allowance structures, and provider capacity.

Financing Challenges

MFAH providers often have limited operating reserves and credit, making it difficult to finance solar projects outside of already scheduled operations and maintenance (O&M) investments.



When housing providers refinance or recapitalize a property, opportunities arise to incorporate solar installations into the project when roof characteristics and sun exposure are favorable. The economic benefits of solar vary based on deed restrictions or regulations, along with available utility incentives and the federal Business Energy Investment Tax Credit (ITC). Even when tax equity or other financing mechanisms are available, providers may also struggle to identify investor partners that are willing to finance the sometimes small projects.

Split Incentives

Providers often pass electricity and natural gas costs on to residents. In master-metered buildings, where all energy costs calculated on one meter are paid by the housing provider, providers may pass the cost of energy on to tenants through their rent. In individually metered buildings, where each unit has its own energy meter, tenants pay their energy provider(s) directly for their home energy. In the latter case, providers may lack incentives to pursue on-site solar projects, particularly in cases where the benefits of solar would accrue to tenants or the federal agency subsidizing the building and not to the housing provider. Encouraging providers to deploy these projects may require additional education or financial incentives.

¹ NREL conducted a technical potential analysis to provide an upper boundary estimate of potential generation of rooftop PV on HUD multifamily assisted properties across the United States (excluding territories). The estimates of developable area per roof were based on delineated and classified PV-developable roof planes created by Gagnon et al. (2016). This study generated statistically representative models of PV-suitable roof planes for 23% of the U.S. building stock in 128 cities using 3D light detection and ranging (LiDAR) surfaces. Multifamily HUD-assisted facilities were identified using publicly available spatial datasets published by HUD, including HUD Insured Multifamily Properties, Multifamily Properties – Assisted, and Public Housing Authorities. These data sets were sorted to exclude facilities not currently receiving assistance and to identify assistance type. Then, the data sets were combined and de-duplicated for a final data set of 26,830 facilities in the United States. Within this population, 34% (n = 9,227) of multifamily housing facilities were within geographic areas that were modeled previously for rooftop PV.

Box 1. Possible Indirect Solar-Related Benefits for LMI Residents of Multifamily Housing

- Improved operation and maintenance of existing property
- Increased resident services (e.g., job training, after-school programs, legal services)
- New property amenities (e.g., free or improved broadband)

Utility Allowance Structures

There are several factors that affect whether solar projects can reduce energy bills for low-income residents in multifamily housing. First, if a building is master-metered (as opposed to individually metered, where utility costs are based on in-unit consumption), it can be a challenge to assign generation from a solar project to an individual bill or unit. Second, each type of publicly supported housing has different rules for calculating utility allowances. Utility allowances are designed to ensure that residents' rent and utility costs combined remain below 30% of their actual income. In short, utility allowances are fixed rates that

an affordable housing provider can charge or otherwise collect from residents, often in combination with rent. For example, if utility costs are higher, rent may need to be reduced to ensure the resident does not pay more than 30% of their income in rent and utility costs. Under certain utility allowance rules, where utility costs are based on the resident's or property's actual consumption (either individually metered or master-metered), the solar project benefits may accrue to the federal program administrator, in many cases HUD, without directly lowering costs and providing financial benefits to the LMI household or the provider. In addition, federal regulations may require that any energy cost savings result in a proportional reduction in the federal subsidy. Faced with these challenges, affordable housing entities have found alternative, indirect ways of assigning the benefits of a solar project to their low-income residents (see Box 1).

Capacity of MFAH Providers

Solar project development requires technical, financial, and legal expertise, among other skill sets. Affordable housing providers may not have this expertise in-house or may face other personnel and capacity constraints. Successful projects typically have at least one champion committed to deploying solar. These champions can help overcome organizational inertia and identify necessary resources, such as technical and financial partners, to ensure successful project completion.

Community Solar Project Models and Considerations From the Field

Some or all of these barriers can be present within a given MFAH provider's portfolio, making it more difficult to finance, construct, and distribute the benefits of a community solar project. The following four community solar project models enable MFAH providers to circumvent these barriers:

1. Solar hosting
2. Utility partnerships
3. New construction/rehabilitation
4. Self-built, off-site community solar.

These models address each of the aforementioned barriers differently. For example, solar hosting addresses financial, split incentive, and capacity barriers, but is less effective in providing benefits directly to tenants. In comparison, self-built, off-site community solar can provide immense tenant benefits (in some situations) but comes with significant financial and administrative capacity requirements. In this section, we briefly describe each of the four models with an example from the field. Then, for each

model, we provide considerations for providers relating to the model's benefits and limitations.

Solar Hosting/Rooftop Lease

MFAH providers can participate in community solar programs by leasing their rooftops as sites for individual or aggregate community solar projects, also known as solar hosting (See

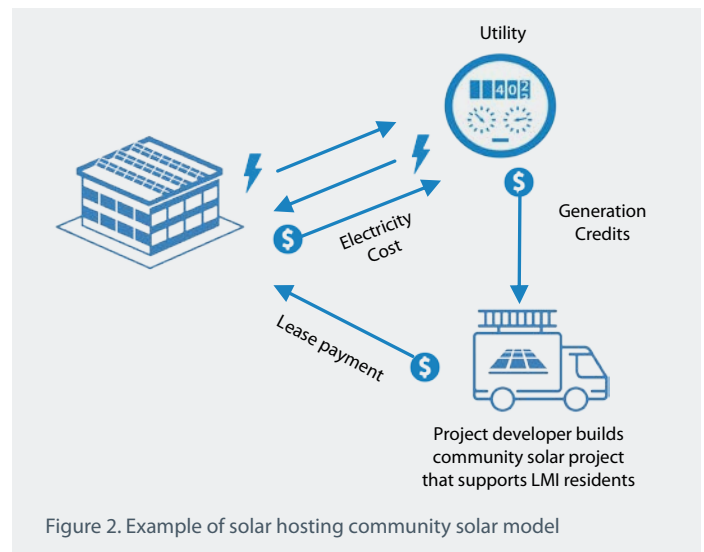


Figure 2. Example of solar hosting community solar model

Figure 2). One example of this program is the New York City Housing Authority's (NYCHA's) ACCESSolar program, which grants rooftop space to developers for a fee, provided that low-income households are subscribed to a minimum of 20% of the capacity. This could include NYCHA residents, HUD Section 8 Rental Assistance Households (i.e., voucher holders), or other eligible low-income households.

Solar Hosting Considerations:

- This model addresses the capacity challenge by limiting administrative and program implementation requirements to negotiating a roof lease agreement, a process with which many MFAH providers are already familiar. Although implementation requirements are more streamlined, they are not eliminated, and the MFAH provider must still oversee and coordinate construction and other responsibilities.
- This approach also addresses the financial, split incentive, and utility allowance challenges. A third party is tasked with financing the project. Lease payments then can be used to offset operation costs and provide an opportunity for enhanced indirect resident benefits (see Box 1).
- Although solar hosting can address key solar adoption barriers, it may not align with the MFAH providers' renewable energy objectives (given that the project's environmental benefits are associated with other customers). It is also important to choose sites carefully and exercise oversight so that installed systems do not impact other roof-related O&M activities.

Utility Partnership

Many utilities are either mandated to or voluntarily develop community solar projects to serve their customers. Some of these utilities are incentivized to or are interested in partnering with MFAH providers to reduce bill payments for low-income households, who often spend a greater proportion of their income on energy bills than the average household (i.e., have higher energy burdens).

One example of this approach is from the Kerrville Public Utility Board in Kerrville, Texas. The municipal utility procured 3.72 MW of community solar capacity spread across four community projects. Fifty percent of the capacity of each community solar project was reserved for an anchor nonprofit housing provider, while the other 50% was reserved for low-income residents of income-qualified affordable housing. Leveraging the savings from peak load transmission cost reductions (where the solar generation offsets the utility's total load at the time of peak electric grid consumption, when electricity rates are highest), the utility was able to provide participating low-income residents an estimated 14% savings on their monthly electric bill. The structure of this community solar partnership is illustrated in Figure 3.

Utility Partnership Considerations:

- Subscription management can be a significant challenge for capacity-constrained MFAH providers, who are frequently relied on to identify or subscribe low-income households. The utility partnership model addresses this barrier through a subscription model in which each subscription is associated

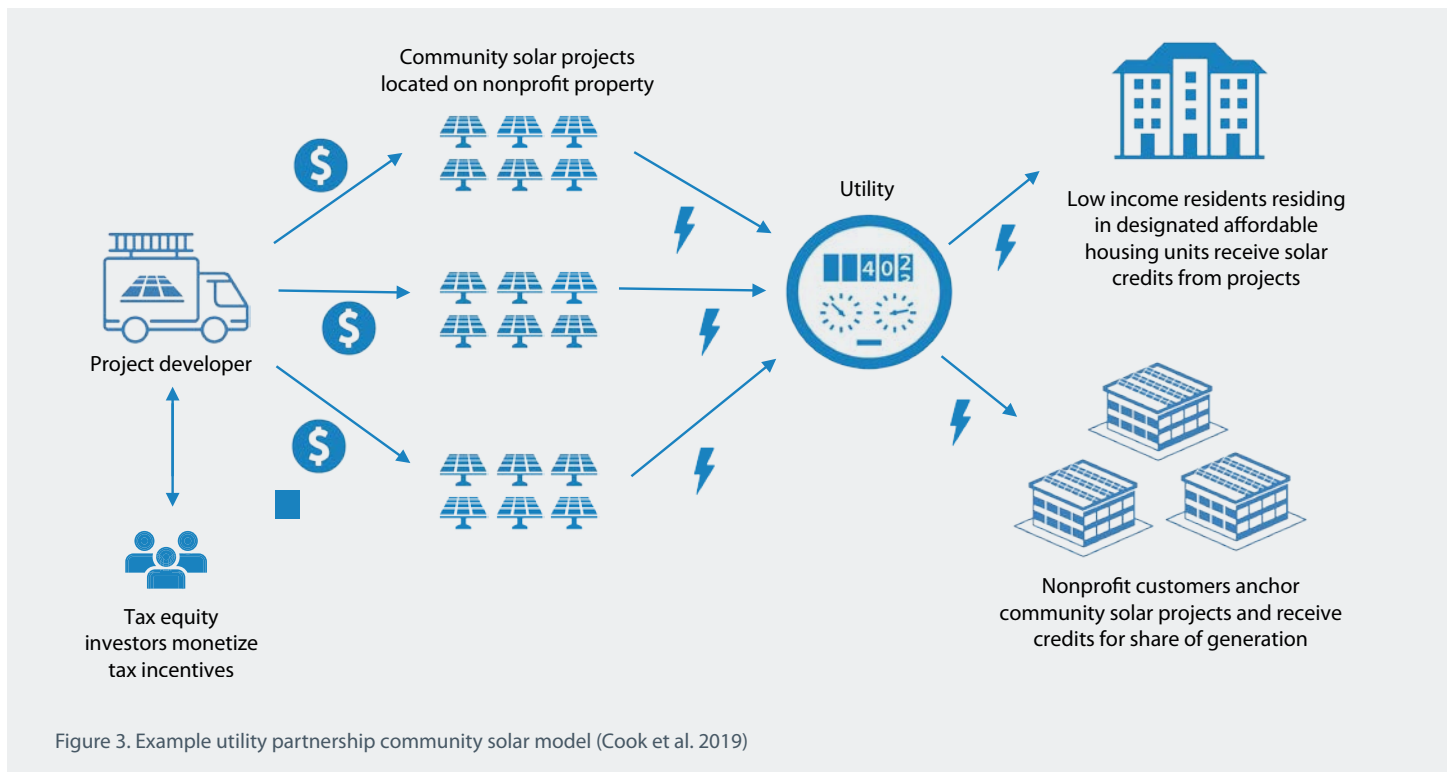


Figure 3. Example utility partnership community solar model (Cook et al. 2019)

with a qualified low-income housing unit. This reduces the subscription management needs for both the utility and the MFAH provider. When a resident moves, another LMI household will move in, and the subscription permanently remains with the housing unit.

- This model can also address financial and utility allowance challenges. In this case, the utility finances the project, and LMI households are subscribed as a part of their residence in an MFAH unit. In addition, this utility allowance structure provides guaranteed bill savings through direct credits on participating households' energy bills. This is possible because utility costs are not based on direct consumption. In other situations, where the housing type and related utility allowance prohibit a direct benefit, it still might be possible to provide indirect benefits through the MFAH provider.
- This approach may not always address split incentive challenges directly, given that the MFAH provider does not benefit from the system, nor can it count toward the provider's own renewable energy commitments.

New Construction/Rehabilitation

Some MFAH providers build new housing and/or rehabilitate existing housing to extend the operating life of the property. When building or significantly renovating a property, the MFAH provider has the potential to incorporate solar as a part of that construction process. Meriden Housing Authority in Connecticut

provides an example of this approach (See Figure 4). Meriden contracted with a third-party installer to construct a 440-kW rooftop community solar project at the time of an extensive rehabilitation with the assistance of the Low-Income Housing Tax Credit (LIHTC), the ITC, and the Modified Accelerated Cost Recovery system (MACRS). These three financing mechanisms covered the cost to deploy the solar project, which provided bill savings of approximately \$135 per household in the first year. These savings accrue to Meriden Housing Authority's operation budget and are reinvested into properties to indirectly benefit residents via improved O&M.

New Construction/Rehabilitation Considerations:

- Managing the construction of new housing or the rehabilitation of existing housing poses a significant contracting and administrative burden. However, solar can be efficiently incorporated into these broader construction or rehabilitation contracts without adding significantly more time or complexity to the already required contracts. However, it is important to consider construction risks and long-term solar O&M activities when making the decision to incorporate solar into a new construction or rehabilitation contract.
- There are also a variety of financing methods available when constructing new housing or rehabilitating existing housing that an MFAH provider could use to incorporate solar that are not available when considering a solar project on its own. Even so, the MFAH provider, often a nonprofit, is unlikely to

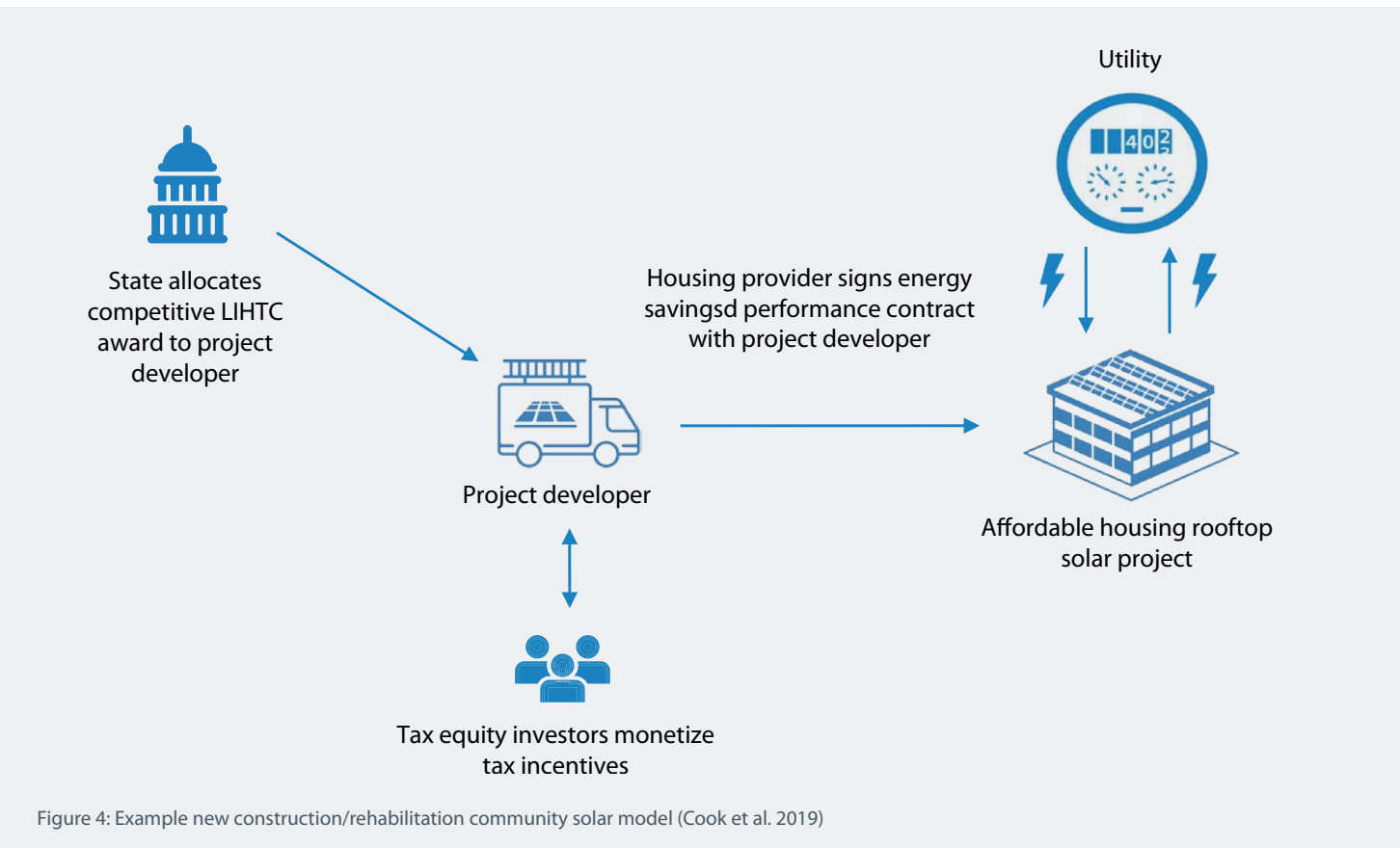


Figure 4: Example new construction/rehabilitation community solar model (Cook et al. 2019)

be able to benefit from certain tax incentives (e.g., ITC and MACRS) and may be required to find investment partners in partnership with their contractors.

- Solar installed at the time of new construction or rehabilitation can also address both utility allowance and split incentive challenges. Depending on the project, an MFAH provider may be able to provide direct or indirect benefits to residents and the provider. These projects can also be used to meet an MFAH provider's emission reduction or renewable energy goals.

Self-Built Off-Site Community Solar

MFAH providers can construct, operate, and maintain their own off-site community solar projects and partner with a utility to deliver the power. Residents may then subscribe to the project through the utility to receive direct or indirect benefits (See Figure 4). One example of this approach is a project completed by the Denver Housing Authority (DHA). DHA partnered with its local energy utility, Xcel Energy, along with other housing providers and investment partners, to install a 2-MW off-site community solar project in Watkins, Colorado. DHA was able to obtain a 20-year solar renewable energy credit agreement with Xcel Energy, in which the utility compensates DHA for the renewable attributes of the community solar system. DHA also employed the ITC and the MACRS to reduce costs and deliver

increased benefits to residents. Although some low-income households benefit directly from lower electricity bills, most participating residents receive indirect, non-economic benefits from this project through improved O&M of existing affordable housing.

Self-Built Off-Site Community Solar Considerations:

- This model addresses financing challenges for community solar projects through a variety of partnerships with investors. Furthermore, these projects can benefit from a partnership opportunity with the local utility.
- This model also mitigates split incentive and utility allowance challenges by providing direct or indirect benefits to residents, depending on where they reside and their associated utility allowance structures. The project also provides direct energy bill savings to MFAH providers and avoids any potential roof quality, use, or suitability issues.
- This model does not alleviate the MFAH provider capacity challenge; rather, it requires significant administrative, contracting, financial, O&M, and energy project expertise that many MFAH providers do not have. For those that do have this expertise, this model can be attractive, because project revenues, with resident input, can be used to reinvest in the mission of the MFAH provider.

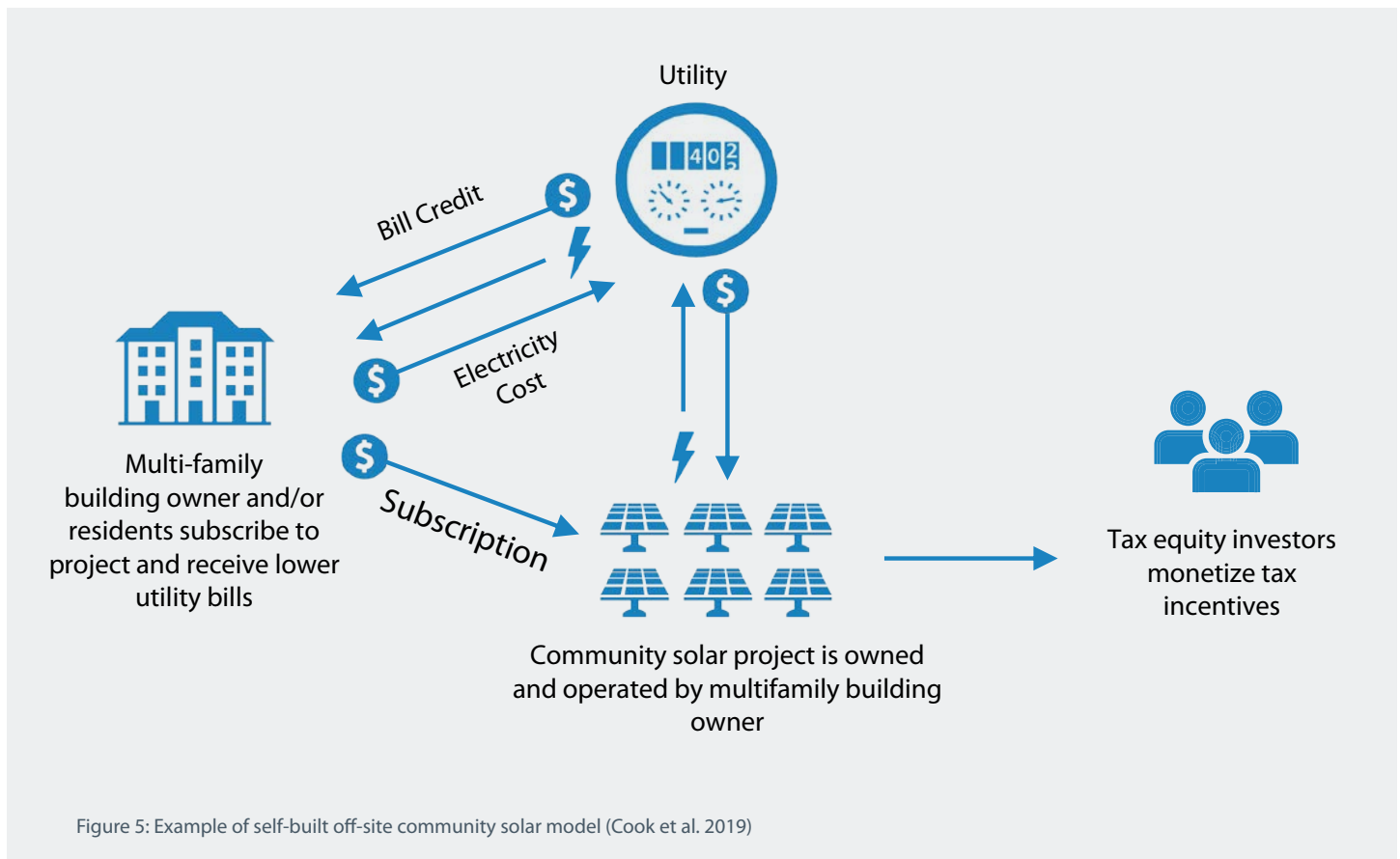


Figure 5: Example of self-built off-site community solar model (Cook et al. 2019)

Conclusion

There is significant potential to offset low-income residents' energy bills through community solar projects deployed at or in partnership with MFAH providers. This document provides some considerations to help providers make more informed community solar decisions. MFAH providers interested in including community solar projects in their portfolios may benefit from other resources developed by the NCSP MFAH Collaborative. These resources can be accessed on the [MFAH Collaborative page](#) of the [NCSP website](#).

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